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ABSTRACT

This paper's major focus is on particular physical-motor domain contributers to the total effectiveness of the person. Topics addressed include: (1) the integrity of the organism; (2) mental achievement; (3) personal-social effectiveness; (4) the nature, extent, and significance of individual differences; and (5) the configuration of physical-motor traits as embodied within the person. Physical fitness components referred to are Roger's Strength Battery and the Medford Boys' Growth Study. Many studies cited in this paper have produced considerable evidence to substantiate physical activity as vital to attaining and maintaining the integrity of the human organism. Evidence presented in various studies generally favors positive relationships between mental achievement and physical and motor fitness components. Significant positive relationships are also revealed between physical and motor fitness tests and personal-social traits. It is noted that certain physical and motor traits, such as maturity, physique type, and body size are not subject to any improvement through exercise; however, other traits, such as muscular strength, muscular endurance, and circulatory-respiratory endurance are definitely improvable through proper exercise regimens. Various profiles of athletes illustrate the configuration of physical motor traits involved in a person's performance. (JMK)

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The Alliance Scholar Lecture 1982

Responsibilities of Physical Education to the Total Person*

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The topic chosen for this Alliance Scholar Lecture is "Responsibilities of Physical Education to the Total Person." It is assumed that the individual is a totality in whatever activity engaged, and should be treated as such by parents, teachers, and youth leaders. In sundry human endeavors, primary traits may differ and supporting traits may vary, but all human traits have some role to play. To illustrate in broad scope: individuals with great motor endowments will not realize their athletic potentialities without organic soundness, adequate strength and stamina, high motivation, and the mentality to make quick decisions and to plan astute strategy; or, individuals with superior mentalities will not realize their intellectual potentialities if they lack vitality because of poor physical fitness or do not direct their abundant energies toward scholarly pursuits; or, individuals with great leadership potentialities will not exert positive influences on their peers if their efforts are directed toward disruptive sets.

As a consequence of such considerations, it must be realized that myriad intrinsic and extrinsic influences constantly affect the total person so that high predictive relationships cannot be expected between physical, mental, and personal-social traits. Researchwise, the solution is further complicated by inability to measure precisely many of the traits involved, especially those in the cognitive and affective domains. However, despite these limitations, significant positive relationships have been shown. Desirable practices to serve the total person should

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be considered logically and implemented energetically.

The physical educator utilizes physical activities in various ways to realize such objectives as physical fitness, personal-social effectiveness, recreational competency, and cultural appreciations. The time constraint for this Lecture necessitated delimitation, so the major focus is on the contributions of the physical-motor domain to the total effectiveness of the person. The topics addressed in dealing with this complex problem are : the integrity of the organism; mental achievement; personal-social effectiveness; the nature, extent, and significance of individual differences; and the configuation of physical/motor traits as embodied within the person.

Preliminary Explanations

Throughout this Lecture, references are made to physical fitness components, Rogers' strength battery, and the Medford Boys' Growth Study. These items are explained here.

Physical Fitness Components. Physical fitness is undergirded by freedom from disease, organic soundness, and adequate nutrition. The physical fitness components proposed are muscular strength, muscular endurance, and circulatory-respiratory endurance. In some relevant studies, "motor fitness" tests were employed, which contain such additional components as muscular power, speed, and agility. These components were accepted by the American Academy of Physical Education in submitting a physical fitness definition and appeared in publications of the President's Council on Physical Fitness and Sports.

Rogers' Strength Battery This battery contains four dynamometric strength, two arm-shoulder muscular endurance, and lung compacity tests.[1] A gross measure, the Strength Index (SI) is obtained as the sum of all tests. A relative measure, the Physical Fitness Index (PFI), is derived by relating the SI to norms based on sex, age, and weight. The distinction here is vital, since gross strength is greatly affected by sex, age, and weight, while relative strength is not. This

distinction is consistently made throughout this address. According to the norms, a PFI of 100 is the median; PFIs of 85 and 115 are at the first and third quartiles.

Medford Boys' Growth Study This growth study was conducted over a period of 12 years in the Medford, Oregon, public schools; the same boys were tested annually from age 7 years until graduation from high school. The tests employed involved the total person, including maturity, physique type, body size and proportion, muscular strength, muscular endurance, motor elements, peer and psychological status, scholastic aptitude and achievement, and interests.[2]

Integrity of the Organism

Kraus and Raab[3] extensively developed the concept of hypokenetic disease as a "whole spectrum of inactivity-induced somatic and mental derangements." Since their book was published 20 years ago, many studies have produced considerable evidence to substantiate physical activity as vital to attaining and maintaining the integrity of the human organism. Illustrations of this evidence from various disciplines are mentioned. In many instances, these investigations have been interdisciplinary in nature, and some having involved physical educators. Unless otherwise indicated, these materials are presented in various issues of the Physical Fitness Research Digest, edited and written by the speaker and published by the President's Council on Physical Fitness and Sports.

Epidemiological studies conducted in several countries revealed an inverse relationship between physical exertion required in occupations and in leisure pursuits and the incidence of coronary heart disease. Such physical activity may not prevent a heart attack, but will make its occurrence less likely; further, in the event of an attack, it is prone to be less severe and the chance of survival greater. Similar results have been associated with other degenerative diseases.

Exercise physiologists and sports medicine specialists have found that

physical activities that stress the circulatory-respiratory system have favorable effects on such coronary risk factors as blood pressure, resting and exercising heart rates, and levels of cholesterol and triglycerides in the blood stream. Such exercise may also reduce cardiographic abnormalities, encourage collateral circulation around coronary artery restrictions, improve myocardial vascularization, increase blood volume, and enhance fibroinolytic capability.

Cardiologists have demonstrated the need for exercise prescriptions in the prevention of and rehabilitation from heart attacks. Also, physicians today recognize the desirability of early ambulation and exercise following major surgery and after childbirth. Further, studies have shown that severe deteriorations of various body functions result from prolonged bed rest by normal subjects.

Nutritionists and others have shown that exercise is an effective partner to diet in fat reduction. Body weight does not always change, as there may be a balancing effect between fat loss and muscle tissue gain.

From rehabilitation medicine, Kraus[4] reported that low back pain in 80 percent of his patients (N=4,000) was due to underexercise resulting in muscular deficiency. He stated further that symptom-free adults were candidates for low back pain episodes if they were unable to pass his minimum muscular fitness test.

Physical education scientists have shown that muscular strength, muscular endurance, and circulatory-respiratory endurance are vital to the integrity of the organism as well as the total effectiveness of the individual. They also determined appropriate applications of exercise for the improvement and maintenance of these physical fitness components. The roles of strength development in conditioning athletes and in preventing athletic injuries have been demonstrated by coaches and trainers; weight-training rooms and weight-training specialists are now commonplace in athletic departments. In a volume edited by Rarick,[5] the role of physical activity in human growth and development was extensively explored.

From an examination of available data, diVries[6] reported substantial agreement that exercise has both immediate and chronic tranquilizing effects on young, middle-aged, and elderly subjects. It has long been recognized that emotional states are reflected in muscular tensions.

From an analytical research review, Morgan[7] indicated that physical activity has a coping effect in the treatment of anxiety and depression. Psychiatric patients, irrespective of their diagnostic category, score significantly lower than the general population on physical fitness tests; and, the prognosis for the physically fit is far more favorable at the time of institutional admission. Layman[8] provided evidence that poor physical condition predisposes to poor mental health.

Geriatrists have shown that exercise can slow, and even reverse in the sedentary, many of the physiological deteriorations associated with aging. These processes involve maximum heart rate, blood pressure, cardiac output, respiratory efficiency, aerobic power, bone resiliency, muscular strength and endurance, body flexibility, and balance.

Some of the organismic conditions mentioned have no age limitations. However, others become manifest in later years, although their origins may occur during childhood and adolescence. For example, Moller[9] indicated that the atherosclerotic process in heart disease often begins in childhood, progresses during adolescence and young adulthood, and becomes clinically manifest in middle age or later. As is generally recognized, fat children often become fat adults. Physical education has responsibilities to orient all students, as well as others, with this knowledge, to provide activity programs for the development of their organism, and to encourage them to incorporate exercise in their present and future lifestyles.

Mental Achievement

From a Physical Fitness Research Digest, (October 1971), the evidence pre-

sented favored positive relationships between mental achievement and physical and motor fitness components, although it must be admitted that some studies have not supported this observation. Such relationships are not sufficiently high for the prediction of academic grades, which is logical since many other factors affect mental productivity, including intelligence, motivation, time spent in study, peer mores, parental influence, and the like. Some illustrated studies are mentioned.

Several Medford Study analyses addressed this problem. Di Nucci obtained 57 significant multiple correlations, the highest being .70, between physical variables and grade point averages and standard academic achievement test scores for boys at each age 9 through 17 years. Moutis contrasted the scholastic achievement of two groups of boys who scored highest and lowest over a three year period on each of 15 physical/motor tests. The tests that were associated with academic achievement were related to maturity, body size, gross strength, muscular power, speed and agility, and total-body reaction time. Jarman paired boys at each age 9, 12, and 15 years into high and low groups on each of five strength and body size measures; the pairings were equated by intelligence quotients. Quite generally, the high groups had superior GPAs and academic test scores: prominent among the physical/motor variables were gross and relative muscular strength, muscular power, and maturity.

Doornink[10] contrasted the academic success of 1,029 men upon graduation from the University of Oregon with their PFI levels when tested four years earlier upon entrance as freshmen. For the lowest 10% on the PFI test, only one in five graduated; for all students, the number was two in five, twice as many. When comparing scholastic honors, which included scholarships won, election to honor societies, and winning of prizes and awards, only seven in 100 in the lowest 20% on the PFI test were so recognized; for all students, the number was 49 in 100, seven times as many. Somewhat similar results were obtained at Syracuse University, University of Massachusetts, and Coos Bay, Oregon, high school with the same test, and at the

United States Military Academy with a motor fitness battery.

Coefield and McCollum[11] studied the scholastic success of 78 University of Oregon freshmen residing in dormitories who had PFIs below 85. These students had higher average scholastic stanines (5.25) on entrance to the University than had all freshmen (4.83). Yet, the low PFI men had poorer academic grades, during the fall term than did other dormitory men; the respective grade point averages were 1.84 and 2.15. During the winter term with improved physical fitness status, the low PFI group increased their average by 14.1 per cent, while the other dormitory freshmen only had an increase of 1.8 per cent.

Hart and Shay[12] reported that the academic achievement of Springfield College students during the first term of their freshmen year was reflected by their PFIs. The GPAs (3-point scale) by PFI groupings were: 115 and above, 2.01; 100 to 114, 1.94; 85 to 99, 1.85; below 85, 1.51. For sophomore women, a correlation of .66 was obtained between PFI and cumulative GPAs with a Scholastic Aptitude score partialled out statistically.

Rarick and McKee[13] and Ismail and Gruber[14] obtained significant positive correlations between motor test items and scholastic achievement measures. The former investigators reported that third grade children who were superior on the test items received a higher number of excellent or good ratings in reading, writing, and comprehension than did those who were inferior. Arnett[15] compared the GPAs of college women classified into good, fair, and poor based on a motor fitness battery. The group with the highest fitness score on each comparison had significantly higher GPA means.

As a consequence of the evidence available, it may be contended that a person's <u>general learning potential for a given level of intelligence</u> is significantly affected by his or her degree of physical fitness. Thus, other things being equal, the quantity and quality of each individual's mental achievement should be greater when physically fit than when physically unfit. The person has the energy and

stamina to mount and sustain intellectual efforts; a preoperational state of vigor and an improved state of learning readiness exists. Consequently, physical education has a responsibility to improve the physical fitness of children and youth as a contribution to their potential success in scholastic pursuits.

Personal-Social Effectiveness

In another Physical Fitness Research Digest, (January 1972), significant positive relationships were revealed between physical and motor fitness tests and personal-social traits. Generally, boys superior on such tests tended to be extroverted, dominant, sociable, dependable, tolerant, active, and competitive; they were prone to be leaders and popular with their peers. Boys inferior on such tests showed feelings of insecurity, inferiority, and inadequacy, and had difficulties in social relationships; they were inclined to be rebellious, emotionally unstable, and defensive, and to have negative self-images. Again, some illustrative studies are mentioned.

From the Institute of Child Welfare, University of California, Berkeley, Jones[16] reported: boys with high dynamometric strength tend to have good physiques, to be physically fit, and to enjoy favored social status; boys low in strength are inclined toward "aesthenic" physiques, poor health, social difficulties, lack of status, feelings of inferiority, and personal maladjustments in other ways. The results for girls were not so pronounced. Jones attributed the positive relationship of muscular strength to prestige traits for boys as evidence of the role physical prowess plays in their adolescent value system. Although it is probably changing today for girls, such was not the case 33 years ago when Jones' study was published.

As a phase of the Medford Study, Broekhoff examined individual profiles of 13-year-old boys who had unusual scores on physical tests. He found that the extreme endomorph and the predominant ectomorph were at distinct disadvantages "in the dynamic physical world of the early adolescent." Boys with high relative

strength and motor ability had social as well as physical advantages over boys with low scores; they were also popular with their peers. Taller boys with high gross strength and advanced maturity tended to be rebellious, defensive, and inhibited; Broekhoff suggested that boys of this type may have adjustment problems associated with early accelerated growth.

Several other Medford Study analyses showed significant positive relationships between physical-motor tests and personal-social traits. The personal-social instruments employed were: the Mental Health Analysis and the California personality Inventory, both established inventory-type tests; peer studies, as revealed by a Sociometric Questionnaire and Cowell's Personal Distance Ballot; level of aspiration, as determined from a grip strength series; and self-image, as shown by the Davidson Adjective Check List. Prominently associated with these personal-social measures were mesomorphy, relative muscular strength, arm-shoulder muscular endurance, muscular power, and speed and agility. Such results were not so prevalent for endomorphy and gross muscular strength.

In the study by Rarick and McKee previously mentioned, case studies revealed that third grade children superior in motor performances tended to be active, calm, popular, resourceful, attentive, and cooperative; children with inferior motor performances were shy, retiring, and tense. Ferguson[17] reported that eleventh-grade girls with superior motor ability had higher means then did those with low motor ability on 14 of the 18 scales of the California Psychological Inventory. Cattell[18] summarized research with his Sixteen Personality Factor Questionnaire by stating: "... when effective personality measures are employed, indubitable relations are perceived between measures of physique and physical fitness on the one hand and psychological measures on the other."

Popp[19] arranged high school sophomore boys with the highest 20 and the lowest 20 PFIs into a single alphabetical list in order to obscure their fitness status. Five faculty members independently chose the ten boys who were most like and the

ten boys who were least like sons they would like to have. The results: for the "most like" boys, 69% had high PFIs; for the "least like" boys, 75% had low PFIs.

From a review of research studies, Cureton[20] listed the following factors as being physical correlates of personality deterioration: accumulation of fat; reduction in metabolic rate; loss of muscular strength; slowing of reaction time; reduction of work capacity; loss of balance, flexibility, agility, power, and endurance; reduction of ventilatory capacity; increases of strains in various areas of the body; and increase in blood pressure. In a study of his own, Cureton found that a large proportion of 500 adults who checked more than five of 16 viscerotonic traits on Sheldon's Temperament Scale were relatively unfit; those who checked more than five of 20 cerebrotonic traits were almost always tense or nervous and tended to be neurotic and relatively unfit. He suggested that personality and physical deteriorations parallel each other.

Evidence exists that improvement of the physical and motor fitness of boys and girls can enhance their personal-social effectiveness. The realization of this effectiveness, however, relies heavily on guidance in order to direct the person into desirable modes of behavior and to heighten interpersonal relationships. Recognition should also be given to the potentialities of sports and games and the application of various procedures and methodologies in the realization of desirable personal-social traits. Logically, then, physical education has a responsibility to improve the physical and motor fitness of children and youth and to apply other appropriate means as a contribution to their personal-social effectiveness.

Nature, Extent, and Significance of Individual Differences

In the fourth section of this Lecture, the nature, extent, and significance of individual differences is considered. As is well known, boys and girls of the same age differ from each other in innumerable ways. In many instances, these differences have profound effects on their total effectiveness. The materials presented here are drawn from the Medford Study. In this project, the boys were

tested each year within two months of their birthdays, so did not vary by more than four months at each chronological age. Examples of the results are given.

Maturity. The major maturity measure utilized in the Medford Study was skeletal age, which is based on the ossification of the skeleton which transpires from birth to adulthood, as revealed by an X ray of the wrist and hand. The skeletal age standard deviations for chronological ages 7 through 18 years clustered between 12 and 15 months, a year or more. The median range was 71 months, nearly six years. The more mature boys were larger and stronger than other boys their age; and they had greater success in athletics. They were prone to higher levels of aspiration, better psychological adjustment, and superior scholastic achievement. The reverse was found for boys who were immature for their ages.

Physique Type. In the Medford Study, physique type was described by application of Sheldon's system of somatotype components. The components, each evaluated on a 7-point scale, are: endomorphy, a preponderance of soft roundness throughout the body with mass concentration in the viscera; mesomorphy, a rectangular physique with massive muscles and large bones; and ectomorphy, a thin linear body structure. Although age differences existed, the distribution by somatotype categories was: 66%, mid-types; 16%, mesomorphs; 11%, ectomorphs; and 7%, endomorphs. Endomorphs were handicapped by excessive body bulk, low relative strength, and inability to make athletic teams; they had negative self-images, but seemed fairly well adjusted psychologically. Mesomorphs had advantages related to gross and relative strength and to athletic participation; they had favorable peer status and were well adjusted psychologically. Ectomorphs and mid-types had disadvantages related to less body bulk and gross strength and advantages pertaining to relative strength; they demonstrated some lack of peer status, but had favorable self-images.

Gross Strength. To demonstrate individual differences in gross strength, data from the spectacular leg lift are given. This lift is recorded on a dynamo-

meter; a belt holds a lifting bar firmly to the subject's hips; the knees are slightly bent at the height of the lift and the back is erect; a maximum vertical lift is performed. The leg lift means increased steadily from 317 pounds at age 8 to 1,453 pounds at 18 years. The lowest and highest ranges were 370 and 1,930 pounds. The highest lifts exceeded a ton at several of the older ages. At all ages, the strongest boys were from two to seven times stronger than the weakest. Gross strength was one of the best differentiators of athletic ability at upper elementary, junior high, and senior high school levels in the sports of football, basketball, baseball, and track and field. Generally, stronger boys showed better psychological adjustment, greater peer status, and enhanced self-image; some significant correlations were obtained with scholastic achievement measures.

Relative Strength. The relative strength measure employed was the PFI. The PFI means of the Medford boys were higher at all ages than the median expectation of 100 according to the norms. The lowest mean was 105; for each of the ages 10 through 17 years, the means nearly reached, or exceeded the normal third quartile of 115. (It may be added that these figures are not unusual in schools with strong physical fitness programs, as is true also for other physical and motor fitness measures.) At all but two ages, the standard deviations clustered between 20 and 22; the PFI ranges varied between 80 and 140. At all ages, the highest PFIs were two to three times greater than the lowest. This measure had significantly positive correlations with motor ability tests. Medford athletes scored high on this test; the PFI means for outstanding athletes exceeded 120 at all school levels and in all sports. Generally, boys with high PFIs were popular with their peers, had a positive self image, scored high on some psychological tests, especially social presence, sociability, and self-acceptance, and did well scholastically.

Muscular Power. The standing long jump was administered as a test of muscular power. The mean distances for the Medford boys increased steadily from almost 4 feet at age 7 to over 7 feet at 18 years. The highest and lowest standard

deviations were 5 and 8 inches; the ranges varied between two and four feet. At the various ages, the boys with greatest muscular power jumped approximately twice as far as did those with least power. At all school levels and in all sports, this jump was a consistent differentiator of athletic ability, ranking well with gross strength measures. Among the physical and motor tests that correlated significantly with this test were the PFI, the average of all cable-tension strength tests, and the 60-yard shuttle run. Boys with longest jumps had positive self-images, tended to be active, ambitious, confident, and alert, and related well with their peers. They also were inclined toward better academic achievement.

A consideration of the nature, extent, and significance of individual differences gives strong support for grouping boys and girls for and/or within physical education classes in order to provide reasonable homogeneity for meeting their physical fitness needs, for effective instruction in motor skills, and for improving opportunities for success experiences in physical and motor endeavors. Presenting the same activities in the same way to all students in physical education classes scheduled by age or grade in school or at random by "free" periods has limited value. Such arrangements may fit the needs of some by chance, but will not do so for most.

Some of the physical and motor traits pertaining to the person's total effectiveness are not subject to appreciable, if any, improvement through exercise; such traits include maturity, physique type, and body size. Perhaps changes can be made in physique components and body size measures when fat deposits and muscular development are involved. However, measures of such traits should be utilized in forming judgments of each person's physical and motor potentialities, as has been done with body weight in constructing norms for strength tests. Other traits are definitely improvable through proper exercise regimens, especially muscular strength, muscular endurance, and circulatory-respiratory endurance. Tests of these basic physical fitness components should be administered routinely, and

appropriate steps should be taken to improve boys and girls who are below acceptable standards on them.

Configurations of Physical-Motor Traits

The final section of this Lecture deals with the configuration of physical-motor traits involved in the person's performances, as contrasted with the differences between persons just considered. This configuration varies among individuals. Each individual will most likely possess strengths in some traits and weaknesses in others, or will show varying degrees of mediocrity. Profiles of Medford athletes illustrate this situation.

Profiles were constructed by Shelley based on 23 physical-motor measures for each Medford athlete rated as outstanding in at least one interscholastic sport. To illustrate the configuration of traits, the profile of a 14-year-old junior high school athlete is described. As contrasted with boys his age, he was below average in skeletal age, height, and weight, and about average in upper arm girth, chest girth, and hip width, but had a large calf girth. Thus, maturity and body size were not advantageous in this athlete's competition. However, his gross and relative muscular strength, muscular endurance and power, speed, agility, and intelligence were superior. His physique type was strongly mesomorphic. Thus, his strengths for athletic competition out-weighed and more than compensated for his weaknesses.

This 14-year-old junior high school athlete was outstanding in three sports: football, quarterback and defensive halfback; basketball, guard and play maker; and track, hurdler. He played summer baseball, leading in batting average and base stealing. Three years later, Medford high school won three state championships in football, basketball, and baseball. He was on all three of those teams and was selected on all-state teams in football and basketball. As a senior, he was chosen as the outstanding scholar-athlete in Oregon. As a collegian, he played football for Stanford University.

Based on test profiles, the means of 38 outstanding elementary and junior high school athletes were above the means of all boys of thier respective ages. The most superior characteristics were gross strength, muscular power, arm-shoulder muscular endurance, speed, and agility. Of less importance, but still well above average, were skeletal age, height, and relative muscular strength. The standing broad jump, 60-yard shuttle run, Strength Index, and Rogers' Arm Strength Score were most frequently found as compensating variables for apparent deficiences when found among the outstanding athletes.

The test profile has considerable merit in physical education since weaknesses that need attention are identified. In effect, the AAHPERD Youth Fitness Test and the new Health Related Physical Fitness Test can be used in this manner, since each item in these batteries is scored on a percentile scale. Corbin and associates[21] have presented "Personal Evaluation Profiles." These profiles provide for an attitude scale and for tests of cardiovascular fitness, muscular strength, muscular endurance, motor fitness, flexibility, fat percentages, posture, and tension. A responsibility of physical education in serving the total person is to utilize test profiles to identify each individual's strengths and weaknesses in order to adapt program content to individual capabilities and to meet individual needs.

From a career long identification with physical fitness programs designed to help boys and girls who had low PFIs, the totality of the individual became strikingly clear.[22] Case studies were conducted for those unfit individuals who did not improve after participating in exercise programs designed to increase their muscular strength and muscular endurance, while not neglecting their circulatory-respiratory endurance. As really should be logical, the cause of muscular weakness may be more than just lack of the right kind and amount of exercise, as essential as they are. The case studies revealed such causes as organic lesions, nutritional disturbances, and psychological maladjustments, and may be associated

with scholastic difficulties. A special responsibility of physical education to the total person is to implement this approach for improving the status of boys and girls who are deficient in basic physical fitness components.

In Conclusion

In this Lecture, responsibilities of physical education to the total person have pertained, firstly to three basic aspects of the individual, the organism itself, mental achievement, and personal-social effectiveness, and, secondly, to differences in physical and motor traits between and within individuals. Obviously, physical education is not a panacea; it cannot guarantee that all the problems of the total person will be met. As pointed out at the start of this presentation, numerous influences affect the complexity of the individual. Still, physical education can contribute dynamically: it can provide an adequate physical fitness base as a launching pad for other human endeavors; also, through sports and games and through the application of appropriate procedures and methodologies, it can contribute to personal-social effectiveness. The ultimate goal may well be beyond one's grasp, but still the attempt should be made and as much progress as possible should be realized.

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